

Using Developing a Just-in-Time Adaptive Mobile Technology Platform for to Facilitate Interviews in Family Medicine Education: Experiential Lessons Learned

Christian Rogers
Indiana University-Purdue University Indianapolis (IUPUI)
United States
rogerscb@iupui.edu

Shannon Cooper
Scott Renshaw
Indiana University School of Medicine
United States
slcooper@iu.edu
serensha@iupui.edu

Jerry Schnepf
Bowling Green State University
United States
schnepf@bgsu.edu

Corinne Renguet
Indiana University-Purdue University Indianapolis
United States
crenguet@iupui.edu

Mary Theresa Seig
Ball State University
United States
mtseig@bsu.edu

Abstract: EASEL (education-through application supported experiential learning) is a platform designed to which provides just-in-time adaptive support of a to students during experiential learning interviews conducted as part of required work in an online course in a family medicine education program in a Midwestern urban university setting EASELby considering the time and location of the student and then providing questions and content before, during, and after the interviews takes place EASEL will provide a new way to facilitate and support online family medicine students as they meet with patients and healthcare professionals of which they are required While the study has been delayed due to development issues, the comparative study is expected to begin in late Fall 2017 The study will evaluate the use of EASEL with a control and experimental group (each with 70 students), their perceptions of the interview process and the grade of their final project It is hypothesized that by utilizing the EASEL platform, family medicine students will be able to quickly refer to information and provide feedback during these interviews and those in the experimental group will have a higher quality final project This paper presents a look at the considerations, issues, and lessons learned during the development process of this interdisciplinary collaborative effort between the platform designers and family medicine faculty while working toward completion of the study

Keywords: mobile learning,navigation,experiential learning,field experiences,instructional design,user experience,usability

This is the author's manuscript of the article published in final edited form as:

Rogers, C., Cooper, S., Renshaw, S., Schnepf, J., Renguet, C., & Seig, M. T. (2017, October). Developing a Just-in-Time Adaptive Mobile Platform for Family Medicine Education: Experiential Lessons Learned. In *E-Learn: World Conference on ELearning in Corporate, Government, Healthcare, and Higher Education* (pp. 948-954). Association for the Advancement of Computing in Education (AACE).

Just-in-Time Adaptive Support

Graesser, McNamara & VanLehn (2005) found that technology can be used to scaffold content into different phases of the inquiry process and allow for deeper learning. Holden & Rada (2007) also found that technology can be used as a guide in a field experience, scaffolding material, and providing reflection opportunities. Currently, field experience is one aspect of education that often receives minimal support from learning management systems (LMS). While current LMS applications do provide opportunities for students to access materials and answer surveys, they can be cumbersome to navigate, especially in a mobile setting. EASEL (Education through Application-Supported Experiential Learning) is a platform designed to provide just-in-time adaptive support to students during experiential learning interviews conducted as part of required work in an online course in a family medicine education program in a Midwestern urban university setting.

Interviews in Family Medicine Education

The Family Medicine Clerkship (FMC) introduces students to the principles and practice of Family Medicine. Students actively participate in the care of patients with family physicians in providing ongoing care of the medical needs of their patients within the context of the family and community setting. Students learn how to put into practice the focus on discrete portions of a patient's medical history and physical concerns within the confines of the patient's total health. Students in the clerkship meet patients who present with acute medical problems, are chronically ill, need preventive health education, or may simply be seeking the support of their physician to cope with the trials and stresses of everyday life. Most importantly, students see patients interacting with their personal physician and witness firsthand the therapeutic power of the doctor-patient relationship.

As a requirement of the FMC, students must complete a *Family & Community Project*. The Family and Community Project serves as a capstone activity that has been designed to bring together what the medical students have learned during their clerkship while emphasizing the mission and values of Family Medicine, essentially applying theory to practice to culminate the experiential learning process. Students must identify a patient or population that faces barriers to health or healthcare, interview both the identified patient or community resource representative and a practicing health care professional who works with that patient or community, and collaboratively find resources that might help the patient or people group address one or more of those barriers. The goals of the Family and Community Project are for the students to

- Acquire a more comprehensive understanding about the impact of health and illness on a patient's life and family/support systems;
- Use a biopsychosocial approach to consider biological, psychological, and social factors and their complex interactions to better understand health, illness, and health care delivery to improve clinical patient care;
- Describe how the integration of community agencies, organizations, and other healthcare providers into patient care can positively impact health care outcomes; and
- Develop strategies to use a team approach to develop a plan to improve health or health care outcomes.

For the assignment specifics, students are to include the following elements:

1. **The Patient's Story.** The students will interview the patient to determine relevant background information and tell the patient's healthcare story in the assignment.
2. **Barriers to Care.** The students will describe at least one barrier to health or healthcare faced by the patient and his/her family. They will describe how the barrier impacts the patient's health and any strategies already in place to overcome the barrier(s).
3. **Improving Health Outcomes.** After meeting with the patient and/or his/her family, the students are to discuss how eliminating or mediating one or more of the barrier(s) can improve the patient's health or health outcomes. As such, students must collaborate with at least one

other health professional or community resource person that interacts with or could interact with the patient or caregiver (i.e., pharmacist, social worker, nurse, teacher, daycare provider, dentist, etc.). This requires scheduling an appointment and an interview in order to work together with the healthcare professional.

4. Critical Thinking: By the end of the four-week clerkship experience, students will document and reflect upon their interaction with the patient and/or his/her family as well on the collaboration with the other healthcare professional.

Because of the nature and requirements of the FMC, students often find themselves “on the run” so-to-speak. Many students are faced with the challenges of meeting with the patients and healthcare professionals at the times most convenient for the interviewees. This often means squeezing the interview in between patients at the clinic or traveling off site. The information and tools for the students are currently housed as multiple PDF files within a Canvas LMS course. Issues have arisen where students have forgotten to download the PDF files prior to the interviews. Other issues have included students misplacing the papers after the interviewing due to the speed at which the clerkship runs. As well, the PDF documents are considered to be long and cumbersome to navigate. Many students have not taken specific notes during a patient interview with the belief that they would remember the information later, only to see six new patients after the interview and not recall what exactly their interviewee said – as such, “which patient said that?” is a common thread. At the completion of both interviews, the students are required to reflect on their experiences by completing a final project.

Students must take these multiple pieces of information collected over three weeks and, then, during their fourth week, complete a comprehensive, reflective, capstone project. Due to the decentralized nature of the FMC, the online learning environment (Canvas), is heavily relied upon for storing course content and student assignments. Canvas also aims to increase the students’ ability to become an active participant in his/her self-directed learning by keeping everything in a centralized course location. However, limitations of Canvas and its mobile app lead to some issues in supporting students as they are participating in these important field experiences (for example, in scheduling their interviews, writing reflections, etc.) as students may not be able to quickly or easily get to a computer once an experience is complete.

A New Way to Support Field Experiences

Because the current practices often leave much time between the experiential activity and the reflection components, a new method is being developed to help better support these experiences. The EASEL platform draws upon the basic theories of constructivism and experiential learning best practices (Kolb 2014) and just-in-time adaptive intervention (Nahum-Shani et al. 2016). The EASEL platform pushes tailored content to the student in a field experience based on the location of the experience and the time of the event. For example, an FMC student schedules an interview using EASEL. She then receives a reminder on the day of the event. At the location of the interview the student receives a reminder to take a preparedness survey before the interview begins. When the interview is scheduled to start the student is automatically presented with a timer to track the length of the interview. Once the interview is completed, the student presses “Stop” and is presented with reflection questions that are to be completed at that time, or the student may “Snooze” to complete the reflection questions with a designated brief time delay, once the student has left the interviewee (i.e. in the car before leaving the location). Future iterations of EASEL will also include analytic tools for collecting and analyzing data from students as well as a connection to LMSs.

Research Questions

- R1: Will the participants who utilize EASEL have a higher quality (grade level) of their final reflection project?

R2: Will the participants who utilize EASEL have a higher satisfaction rate with their interview experiences than those who did not utilize EASEL?

R3: Will those in the experimental group find EASEL intuitive to navigate and use?

Literature Review

Over the years, there have been a number of progresses in science, technology, and medical care. Changes in science and medicine have significant effects on medical education and a number of activities are being utilized to ensure diversity of the clinical education of medical students (Nutter and Whitcomb n.d.). Like many other fields, the opportunity for student reflection on their learning experiences is present in undergraduate medical education. One way to enhance the experience for medical students and patients is by utilizing the experiential learning theory. With students wanting to spend less time in the classroom and more time gaining valuable experience, a platform that utilizes learning through guided, real-world experiences provides the opportunity to gain knowledge through repeated action and reflection (Kolb 1984, 2009). Experiential learning allows students to ask questions, solve problems, and later apply knowledge and abstract understanding to various learning environments such as the classroom, interviews, procedures, simulations, and experiments (Association for Experiential Education 2016).

Experiential Learning in Medical Education

The Experiential Learning Theory was originally presented by David Kolb (1984). Kolb's model exposed the idea of learning through discovery and experiences. The four stages of the model include 1) concrete experience, 2) reflective observation, 3) abstract conceptualization, and 4) active experimentation. The overall goal of the stages listed is to reflect on experiences and decide how to put them into practice later.

In the *Theories in Medical Education* series, Yardley states the importance of implementation of the experiential learning theory in medical education. For many years, medical education was considered 'on the job' training, but with changing times, the need for learning from prior experience affects how students approach new experiences (Yardley, Teunissen, and Dornan 2012). In medical schools across the country, many are incorporating experiential learning into curricula through simulation and procedure clinics with training modules constructed based on Kolb's Experiential Model. The University of Rochester Medical Center combined Kolb's and Knowles' principles as a foundation for their simulation center (Nutter and Whitcomb n.d.). On the other hand, the Center for Education and Research in Family and Community Medicine at Stanford University School of Medicine developed a "value added medical education" program that embeds experiential learning opportunities into the medical curriculum starting with first year medical students with the goal of adding value to the care of patients (Lin, Schillinger, and Irby 2015).

In a systematic review of research literature on experiential learning in nursing and medical education, a number of studies were found that discussed areas of medicine in which experiential learning was implemented. In many of the studies, it was understood that experiential learning has "facilitated the sharing of knowledge and emotions" but studies are limited in the contextual influences that hinder the development of reflective learning (Allodola 2014).

Values of Prompted Reflection

The second stage of Kolb's Experiential Learning Theory is reflective observation where learner's reflect on the initial experiences. The act of reflection occurs often in medical education. The University of Maryland School of Medicine conducted a study that to find out if an Evidence-Based Medicine exercise with a debriefing session would lead students to reflect on the skills learned (Lewin et al. 2014). Several methods of reflection occur in education including writing assignments, face-to-face feedback, and written feedback. The results of the survey found that 95% of students who completed debriefing following the

exercise had a better understanding of their learning experience. Just-in-time adaptive intervention (JITAI) platforms change depending on the needs of the context and needs of the learners (Nahum-Shani et al. 2016). JITAIs have emerged recently in mobile health applications to assist patients with changes in behavior (Nahum-Shani et al. 2016); Nahum-Shani, Hekler, & Spruijt-Metz 2015). Facilitating just-in-time content reminders and reflection prompts could benefit students with the reflection process and internalizing their learning.

Methodology

The study will evaluate the use of EASEL with a control and an experimental group (each with 70 students), their perceptions of the interview process, and the grade and content assessment of their final project. It is hypothesized that by utilizing the EASEL platform, family medicine students will be able to quickly refer to information and provide feedback during these interviews and those in the experimental group will have a higher quality final project.

Participants

The FMC is a required four-week clinical rotation for all 360+ third-year medical students. The FMC is designed and administered by the Department of Family Medicine at the Indiana University School of Medicine. The FMC is decentralized assigning students to family medicine physician in clinical locations throughout Indiana. Four days of each week on the rotation are spent with an assigned family medicine physician in his/her medical office. Each student with the FMC must complete two interviews. One interview is with a patient to understand the barriers to their healthcare. The other interview is to meet with a healthcare professional to understand how to help overcome those barriers. At the completion of both interviews the student must complete a final project as a reflection piece based on the interviews.

Procedure

For each four-week rotation the students will be assigned to two primary groups. Those that utilize an Android device will serve as the control group. Their involvement with the study will be limited to review of their final project content and grades. This group will serve as a baseline. Those students that utilize an iPhone will be assigned to the experimental group (currently, EASEL is only available for iOS devices). Each individual will utilize the EASEL iOS app to complete one of the two interviews (chosen at random) while they will utilize materials in Canvas to support them for the secondary interview. When utilizing EASEL, students will receive notifications from EASEL to take a pre-interview preparedness survey and review questions before going on the interview. During the interview they will track their time. After the interview they will receive questions for reflection. The control group and those students in the experimental group (when not using EASEL) will have access to the same pre-interview and post-interview questions and resource documentation utilizing a page on Canvas. They will not be given prompts of any kind to answer questions before or after an interview.

At the completion of each cohort, students in the experimental group will complete a short survey evaluating the satisfaction rating of the interview experience and questions about their perceptions of utilizing EASEL as a part of the interview experience. Both groups will also complete a final project where they will be evaluated based on a rubric. Final project data will be compared and analyzed utilizing content analysis and a two-tailed t-test for grades. The data will also be analyzed to compare the satisfaction rating of the interview experience between groups. As well, the perceptions of the EASEL app will be evaluated to further inform future EASEL development.

Preliminary Lessons Learned

Development of the EASEL platform is still in process and thus data has not been collected as of the submission of this proceedings. Regardless, multiple lessons have been learned in this process and are presented here as benefits and challenges.

Benefits

When designing a tool for educational use, it is valuable to consider working outside of one's own discipline. Through the EASEL development process this interdisciplinary research team has developed multiple relationships with those that want to utilize EASEL within their classroom and discipline. EASEL was originally developed with the intention of being utilized within a video production classroom. Since its inception multiple disciplines have shown interest. Nevertheless, as a team we have had to be selective in what we are willing to consider as a partnership. Different disciplines may want to see major adjustments to the application, which can therefore cloud the focused research that EASEL is trying to promote (that being support of experiential learning and reflection). Staying focused on the main goals while collaborating with other disciplines has given the team a vision for future iterations and demand opportunities. The interdisciplinary partners make the implementation ideas more comprehensive, and the students all benefit from innovative curricular development and useful technological intervention.

Challenges and Future Considerations

Using student workers can be a valuable addition to innovative projects, and working on a client project is a great experience for students (experiential learning). However, when considering students to work on a technological development client project, it is critical to find students with sufficient skills, including not only technological skills, but also time management, project management, and communication skills. When developing EASEL, one student worker with iOS development experience was needed; however, through misrepresentation of relevant skills, the student was unable to complete the necessary work on time. As researchers, we recommend having students provide multiple examples of technological skills, as well as project management examples from previous project work. We also recommend establishing a meeting schedule that would allow for flexibility while still maintaining a clear stream of communication between the researchers and the student developer. It is also important that all involved parties understand that students may take longer than expected to complete projects. A tool such as Gitlab can be used for task analysis and reporting of progress. Luckily, we have another student with these critical skills and are on track to complete the study.

Conclusions

Experiential learning is the process of gaining knowledge through experiences and reflection outside of the conventional academic setting. Kolb's theory contains the following elements including: reflection, synthesis, decision making, accountability, and an experience that allows for natural trial and error. Keeping Kolb's theory in mind, the use of experiential learning and prompted reflection can be applied to medical education. For years, experiential learning was implemented into medical education, with many studies showing successful reflection that could lead to advances in patient care.

After searching the literature, there is limited research related to using just-in-time adaptive reflection through mobile technology in medical education. Of the literature found, most focused on using mobile applications for direct medical-related applications. These include anatomy, diagnosis, otoscopes, behavioral changes, etc. The literature review demonstrates a gap in using just-in-time adaptive reflection for experiential learning in medical education. However, the information gained from this literature review can be applied in current medical student education through a number of avenues. One example is the use of EASEL to help support student engagement with pre-experience, experience, and post-experience modules. This interdisciplinary team of researchers and developers experienced their own learning

through this process, and will continue collaborating on this innovative curricular development and technological intervention project.

References

Allodola, V. F. (2014). The effects of educational models based on experiential learning in Medical Education: an international literature review. *Tutor*, 14(1): 23-49. DOI: 10.14601

Association for Experiential Education. (2016). Retrieved December 23, 2016 from <http://www.aee.org/what-is-ee>.

Graesser, A. C., McNamara, D. S., & VanLehn, K. (2005). Scaffolding deep comprehension strategies through Point&Query, AutoTutor, and iSTART. *Educational psychologist*, 40(4), 225-234.

Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall.

Kolb, A. Y. & Kolb, D. A. (2009). The Learning Way: Metacognitive Aspects of Experiential Learning. Simulation and Gaming.

Lewin, L. O., Robert, N. J., Raczek, J., Carraccio, C., & Hicks, P. J. (2014). An online evidence based medicine exercise prompts reflection in third year medical students. *BMC Medical Education*, 14(164): 1-7. DOI: 10.1186/1472-6920-14-164

Lin, S. Y., Schillinger, E., & Irby, D. M. (2015). Value-added medical education: Engaging future doctors to transform health care delivery today. *Journal of General Internal Medicine*, 30(2): 150-151. DOI: 10.1007/s11606-014-3018-3

Nahum-Shani, I., Smith, S. N., Spring, B. J., Collins, L. M., Witkiewitz, K., Tewari, A., and Murphy, S. A. (September, 2016). Just-in-time adaptive interventions (JITAIs) in mobile health: Key components and design principles for ongoing health behavior support. *Annals of Behavioral Medicine*. DOI: 10.1007/s12160-016-9830-8

Nahum-Shani, I., Hekler, E. B., Spruijt-Metz, D., (2015). Building health behavior models to guide the development of just-in-time adaptive interventions: A pragmatic framework. *Health Psychology* 34, Supplement, 1209-1219.

Nutter, D., & Whitcomb, M. (n.d.). *The AAMC Project on the Clinical Education of Medical Students*. Retrieved December 23, 2016 from <https://www.aamc.org/download/68522/data/clinicalskillsnutter.pdf>

Yardley, S., Teunissen, P. W., & Dornan, T. (2012) Experiential learning: Transforming theory into practice, *Medical Teacher*, 34(2): 161-164, DOI: 10.3109/0142159X.2012.643264